University of Mumbai

Program: **Cyber Security**

Curriculum Scheme: Rev2019

Examination: SE Semester : IV

Course Code: CSC401 Course Name: Engineering Mathematics – IV Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Evaluate $\int_0^{1+i}(x^2+iy)dz$ along the path $y=x$
Option A:	$\frac{-1+5i}{6}$
Option B:	6
Option C:	-1
Option D:	0
2.	The function $f(z)=\frac{z^2}{(z+2)(z-1)^2}$ has
Option A:	simple pole at z = -2 & pole of order 2 at z = 1
Option B:	simple pole at z = 2
Option C:	simple pole at z = 0 & pole of order 1 at z = 2
Option D:	simple pole at z = 0
3.	If λ is the eigen value of matrix A then $1/\lambda$ is eigen value of
Option A:	A^{-1}
Option B:	A^2
Option C:	A-I
Option D:	$\|A\|$
4.	If 1, 2 & 3 are eigen values of matrix A then eigen values of matrix A^2 are
Option A:	2, 3 & 9
Option B:	1, 4 & 9
Option C:	2, 3 & 2
Option D:	0, 3 & 9
5.	If $Z\{f(k)\}=\frac{1}{1-\frac{4}{z}}$ then the region of convergence is
Option A:	$\|z\|>4$
Option B:	$\|z\|=0$
Option C:	$\|z\|=1$
Option D:	$\|z\|=2$

6.	Find the Z-transform of $\delta(k)$ where $\delta(k) = 1 \quad k = 0$ $= 0 \quad otherwise$
Option A:	1 for all z
Option B:	0 for all z
Option C:	10 for all z
Option D:	4 for all z
7.	Find the mean & variance of the following distribution $P(X = x) = \frac{e^{-2}\, 2^x}{x\,!}$, x = 0, 1, 2, -, -, - - - - - - -
Option A:	0
Option B:	1
Option C:	2
Option D:	3
8.	Find the probability that a random variable having the standard normal distribution will take a value between 0.87 and 1.28.
Option A:	0.0919
Option B:	1
Option C:	0.2324
Option D:	0
9.	How many basic solutions does following LPP has ? Max Z = $x_1 - 2x_2 + 4 x_3$ Sub to $x_1 + 2x_2 + 3 x_3 = 7$; $3x_1 + 4x_2 + 6 x_3 = 15$
Option A:	1
Option B:	2
Option C:	3
Option D:	4
10.	Find the stationary point for Optimise Z = $6 x_1^2 + 5x_2^2$ Subject to $x_1 + 5x_2 = 7$; $x_i \geq 0$
Option A:	(7/31 , 42/31)
Option B:	(1 , 0)
Option C:	(3/10 , 6)
Option D:	(2, 8)

<table>
<tr><th>Q2.</th><th>Solve any Four Questions out of Six 5 marks each</th></tr>
<tr><td>A</td><td>Evaluate $\int_C \frac{dz}{z^3(z+4)}$ where C is the circle $|z|=2$</td></tr>
<tr><td>B</td><td>Find the eigen values & eigen vectors for $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$</td></tr>
<tr><td>C</td><td>Find the inverse Z-transform of $f(k) = \frac{1}{(z-3)(z-2)}$, $|z| < 2$</td></tr>
<tr><td>D</td><td>Fit a Poisson Distribution to the following data
<table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>f</td><td>192</td><td>100</td><td>24</td><td>3</td><td>1</td></tr></table></td></tr>
<tr><td>E</td><td>Solve the following LPP by Simplex method
Max $Z = 7x_1 + 5x_2$
Subject to $-x_1 - 2x_2 \geq -6$
$4x_1 + 3x_2 \leq 12$
$x_1, x_2 \geq 0$</td></tr>
<tr><td>F</td><td>Solve the following NLPP by Lagrange's Multiplier method
Optimise $Z = 7x_1^2 + 5x_2^2$
Subject to $2x_1 + 5x_2 = 7$
$x_1, x_2 \geq 0$</td></tr>
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<table>
<tr><th>Q3.</th><th>Solve any Four Questions out of Six 5 marks each</th></tr>
<tr><td>A</td><td>Using residue theorem evaluate $\int_C \frac{3z^2+z}{z^2-1}\,dz$ where C is the circle $|z|=2$</td></tr>
<tr><td>B</td><td>Show that the matrix $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ is diagonalisable. Find the transforming matrix and the diagnonal form.</td></tr>
<tr><td>C</td><td>Find the Z[f(k)] where $f(k) = \frac{1}{2^k} * \frac{1}{3^k}$</td></tr>
<tr><td>D</td><td>For a normal variate with mean 2.5 and standard deviation 3.5. Find the probability that
i) $2 \leq x \leq 4.5$
ii) $-1.5 \leq x \leq 5.5$</td></tr>
<tr><td>E</td><td>Solve the following LPP by Big M- method
Max $Z = 5x_1 - 2x_2 + 7x_3$
Subject to $2x_1 + 2x_2 - x_3 \geq 2$
$3x_1 - 4x_2 \leq 3$
$x_2 + 3x_3 \leq 5$
$x_1, x_2, x_3 \geq 0$</td></tr>
<tr><td>F</td><td>Solve the following NLPP by Lagrange's Multiplier method
Optimise $Z = 7x_1^2 + x_2^2 + x_3^2 - 10x_1 - 6x_2 - 4x_3$
Subject to $x_1 + x_2 + x_3 = 7$ $x_i \geq 0$</td></tr>
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Q4.	**Solve any Four Questions out of Six** **5 marks each**
A	Expand $f(z)=\dfrac{1}{(z-1)(z-2)}$ in the regions i) $\lvert z\rvert<1$ ii) $1<\lvert z-1\rvert<2$
B	Find the characteristic equation of matrix A given below and hence find the matrix represented by $A^8-5A^7+7A^6-3A^5+A^4-5A^3+8A^2-2A+I$, where $A=\begin{bmatrix}2&1&1\\0&1&0\\1&1&2\end{bmatrix}$
C	Find the Z-transform of $f(k)=3^k,\ k\geq 0$
D	In a survey of 200 boys of which 75 were intelligent, 40 had educated fathers, while 85 of the unintelligent boys had uneducated fathers. Do these figures support the hypothesis that educated fathers have intelligent boys.
E	Solve the following LPP by Dual Simplex method Min $Z = 2x_1 + x_2$ Subject to $3x_1 + x_2 \geq 3$ $4x_1 + 3x_2 \geq 6$ $x_1 + 2x_2 \leq 3$ $x_1, x_2 \geq 0$
F	Find the optimum value of the objective function $Z = 10x_1 + 10x_2 - x_1^2 - x_2^2$ Subject to $x_1 + x_2 \leq 14$ $-x_1 + x_2 \leq 6$ $x_i \geq 0$